

Three new species and one new record of the family Neanuridae (Collembola) from Japan.

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Abstract Three new species, *Vitronura kunigamiensis* sp. nov., *Propeanura yambaru* sp. nov., *Neanura nijimae* sp. nov., are described from Japan. *Yuukianura szepteyckii* Deharveng and Weiner, 1984 is recorded from Japan for the first time.

Key words: description, distribution, *Vitronura*, *Propeanura*, *Yuukianura*, *Neanura*

Introduction: Neanuridae is one of the group in Collembola which does not have enough taxonomical and ecological information, because the species belonging to Neanuridae often show small distribution range and low density. Thus, we must continue to describe new species and increase the knowledge about this group. In this study, we describe two new species which was collected at the research project of 'Assessment of human impacts on the forest biodiversity and development of mitigation techniques in Yambaru, northern part of Okinawa Island', and one new species at the research of the influence of forest managements to soil fauna in Hokkaido. In addition, we report one new record in Japan (the second record in the world) for the species described in North Korea. The specimens was collected at the bank of river in Fukuoka by chance.

Abbreviations: The following abbreviations are used in this paper: a₁, first anterior seta; a₂, second anterior seta; Abd. I-VI, abdominal segments I-VI; Ant. I-IV, antennal segments I-IV; Dit, dorsointernal tubercle; Det, dorsoexternal tubercle; Dlt, dorsolateral tubercle; m, middle seta; p, posterior seta; Lt, lateral tubercle; Th. I-III, thoracic segments I-III.

Vitronura kunigamiensis sp. nov.

[Japanese name: Kunigami-ibotobimushi]

(Figs. 1, 2, 3)

Body oval-shaped. Body length 1.1mm, small. White in alcohol.

Number of dorsal tubercles: 6, 6 / 6, 8, 8 / 8, 8, 8, 4, 2 (Fig. 1). Arrangement of tubercles typical of this genus. Clypeal, antennal, frontal and ocular tubercles on median area of the head separated (Fig. 2A). Occipital area and Th. I with 3+3 tubercles, Dit, Det and Lt. Each of Dit on Th. I widely separated. Th. II - Abd. IV with four pairs of tubercles, Dit, Det, Dlt and Lt. Abd. V with two pairs of tubercles, dorsal tubercles projected posteriorly, half part of the lateral tubercles arranged ventrally. Abd. VI with one pair of large tubercles, arranged mostly on ventral part and behind Dit on Abd. V from dorsal view (Figs. 1, 2B). Chaetotaxy as follows (Fig. 1):

Head +2)
 ----(i+1)
 +1)----(1+i)
 -(1)------(ii+1)------(11-12)
 Th. I -----(1)------(1+i)------(1)
 II --(ii+1)-----(s+ii+1)-----(2+i+s)-----(1+ii)
 III --(ii+1)-----(s+ii+1)-----(2+i+s)-----(1+ii)
 Abd. I --(i+1)-----(1+i+s)-----(i+1)-----(1+i)
 II --(i+1)-----(1+i+s)-----(i+1)-----(1+i)
 III --(i+1)-----(1+i+s)-----(i+1)-----(1+i)
 IV --(i+1)-----(1+i+s)-----(i+1)-----(3+ii)
 V --(i+1+i)------(s+1+ii-iii)
 VI -----(7)

O-seta on frontal tubercle, D- and E-setae, on antennal tubercles and p-seta on ocular tubercles absent. Median area of head with long and acuminate macrochaetae (F-seta on clypeal tubercle, B-seta on antennal tubercles and m-seta

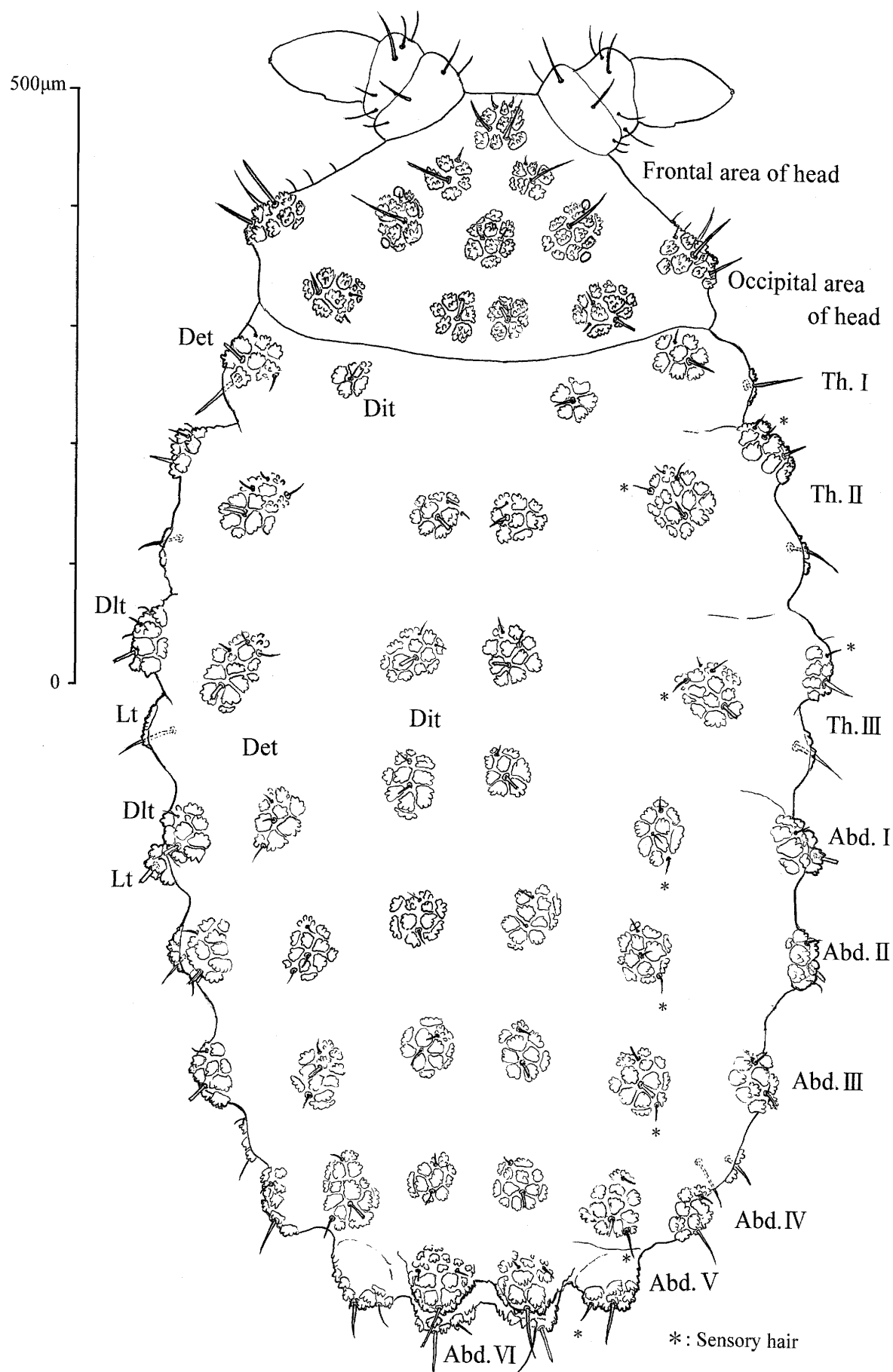


Fig. 1. *Vitronura kunigamiensis* sp. nov., holotype, female. Dorsal view.

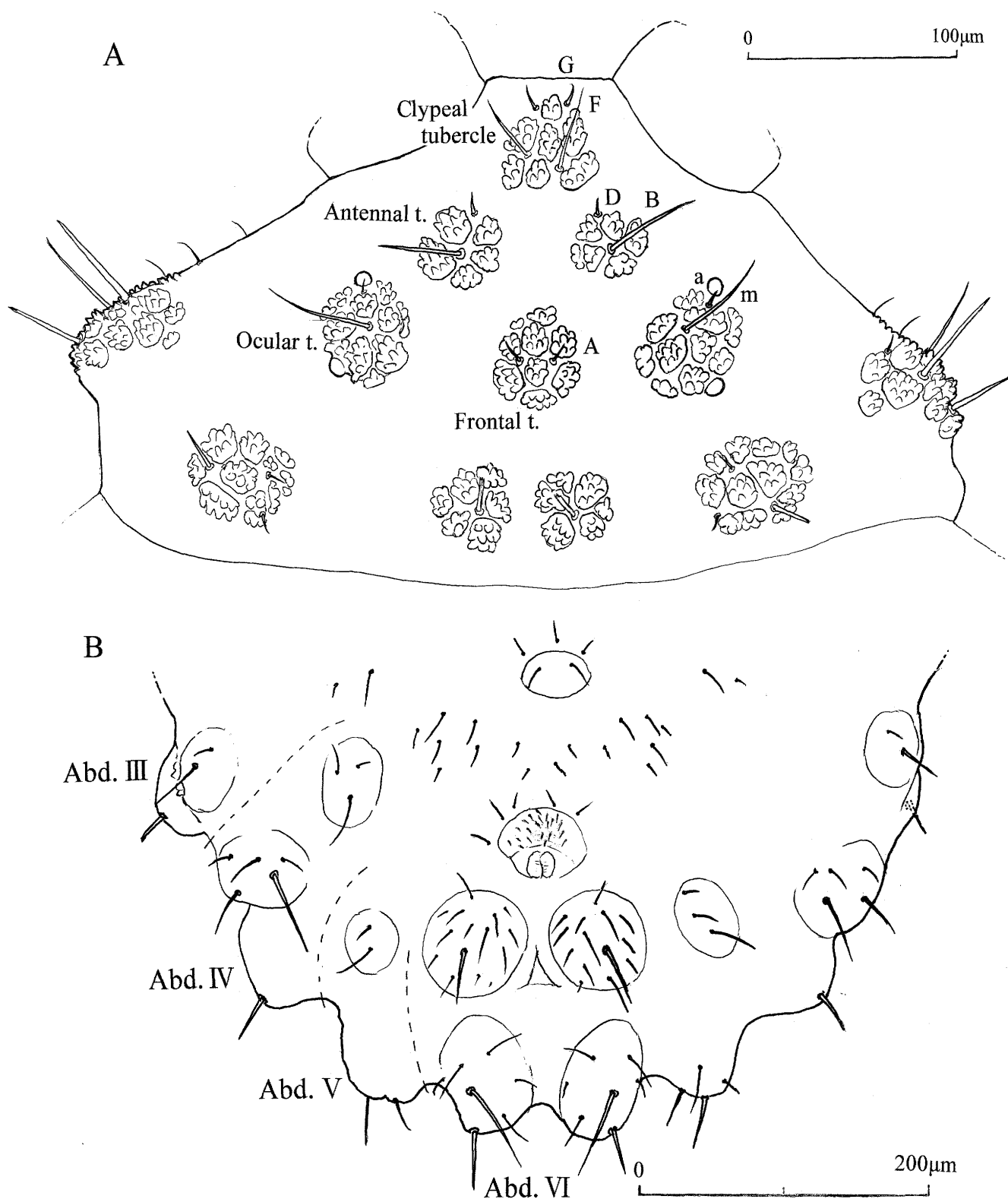


Fig. 2. *Vitronura kunigamiensis* sp. nov., holotype, female. A, head; B, ventral view of Abd. III-VI.

on ocular tubercles). On the area from occipital area of the head to abdomen, most of dorsal tubercles with a short, blunt and faintly barbed macrochaetae. Undeveloped ones of such macrochaetae, especially of juvenile specimens, sometimes

acuminate and difficult to distinguish with mesochaetae. Det and Dlt of Th. II and III, Det of Abd. I-IV and Lt of Abd. V, with a short sensory hair.

Labrum head pointed (Fig. 3A). Labium conical-

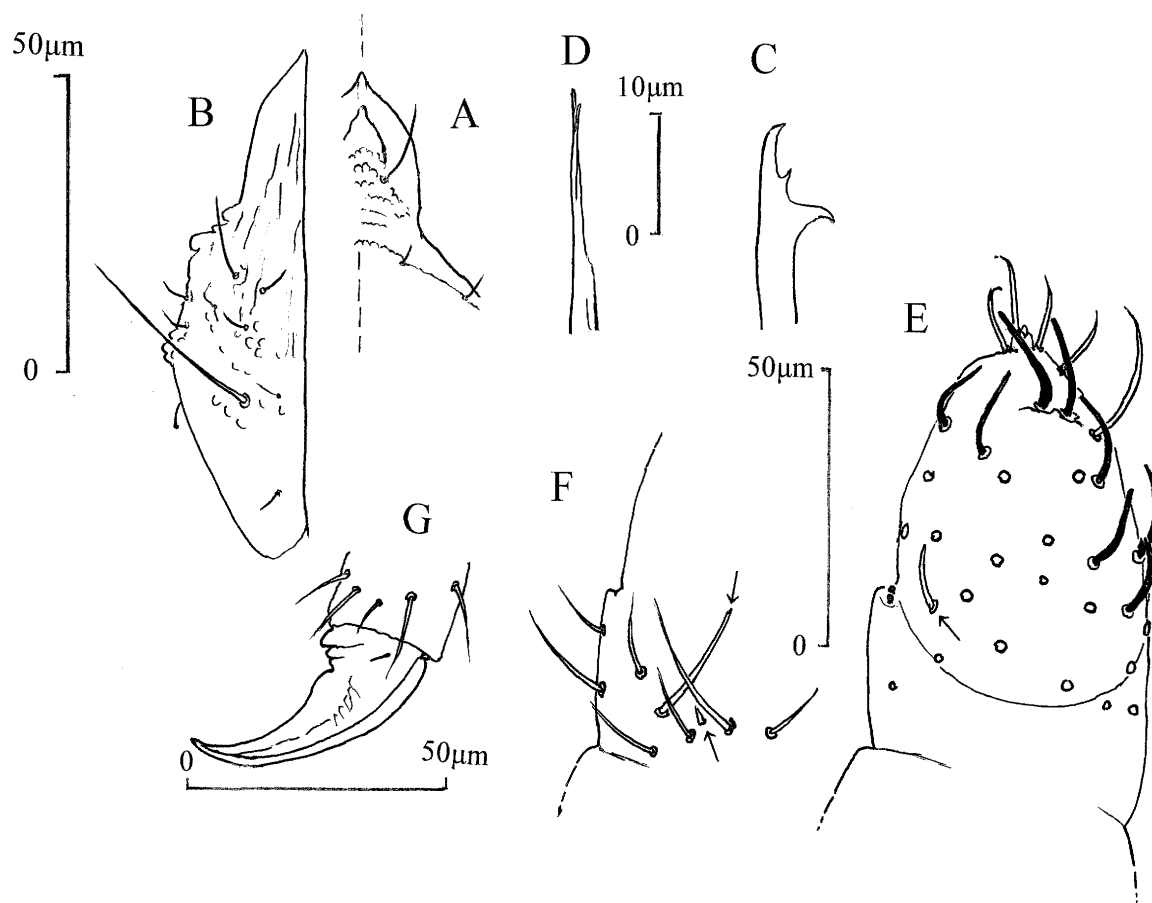


Fig. 3. *Vitronura kunigamiensis* sp. nov. A, labrum; B, labium; C, mandible; D, maxilla; E, dorsal side of Ant. III - IV; F, ventral side of Ant. III; G, unguis of hind leg. E, F, holotype, female; A-D, G, paratype, male. Arrows show sensory hair and a small appendage.

shaped (Fig. 3B). Mandible tridentate (Fig. 3C). Maxilla styliform, bifurcate at apex (Fig. 3D). Ant. III and IV fused dorsally. Ant. III organ consisting of 2 papillae in a large hollow, dorsally with a sensory hair (Fig. 3E), and ventrally with a sensory hair and a small appendage (Fig. 3F). Ant. IV apically trilobed and with 8 olfactory hairs, two on outer side, six on inner side dorsally (Fig. 3E). PAO absent. Ocelli 2+2, placed on anterior and posterior outer side of ocular tubercle each other, unpigmented. Tenent hair of legs absent. Unguis large and untoothed (Fig. 3G). Unguiculus absent. Ventral tube with 4+4 seta apical-laterally. Furca reduced, 1+1 setae on rest area.

Type material: Holotype female, an evergreen broadleaved forest which has no records of clear-cut on the slope of Mt. Nishimedake, Kunigami-son, Okinawa main land, 11 May 2005, M. Hasegawa leg. Paratype male same locality, 3 Jun. 2006. Holotype (Type No. 3271 Kyushu Univ.) and a paratype are deposited in the Entomological Laboratory, Faculty of Agriculture, Kyushu University.

Other materials: Five specimens (female and 4 juveniles), same data as for holotype, 17 Nov. 2007.

Remarks: The present species is characterized by the absences of C- and E-setae on antennal tubercle and O-seta on frontal tubercle, two setae on ocular tubercles and Dit on Abd. V separated. The present new species resembles *V. luzonica* Yosii, 1976 (recorded in Philippines) and *V. gressitti* Cassagnau and Deharveng, 1981 (recorded in Papua New Guinea and Brunei), in having small tubercles and lacking O-seta of the head. But *V. luzonica* and *V. gressitti* is different with the present species by their long and strong macrochaetae on Dit of occipital area, thorax and abdomen (short and faintly barbed macrochaetae in the present species) and C- and E-setae on antennal tubercle (lacking in the present species) (Yosii, 1976, Cassagnau and Deharveng, 1981).

Etymology: The specific name is derived from the type locality.

Propeanura yambaru* sp. nov.*[Japanese name: Yanbaru-ibotobimushi]****(Figs. 4, 5, 6A-G)**

Body elongate, resembled with *Yuukianura*. Body length 1.4mm. Colour white in alcohol, unpigmented except ocelli. Secondary granules or some clumped structures of segmental tubercles developed, but without alveolar network.

Number of dorsal tubercles: 6, 8 / 6, 8, 8 / 8, 8, 8, 8, 2 (Fig. 4). Clypeal, antennal, frontal and ocular tubercles on median area of the head separated (Fig. 5A). All tubercles low, boundary of clypeal tubercle obscure. Occipital area with four pairs of tubercles, Dlt separated from Lt. Th. I with three pairs of tubercles, Dit, Dlt and Lt; Dit placed apart from dorsal midline. Th. II - Abd. V with four pairs of tubercles, Dit, Det, Dlt and Lt. Det on Abd. V, well represented with a short sensory hair, close to Dit and Dlt, but clearly separated from them (Fig. 4). On Abd. V, Lt placed ventrally (Fig. 5B). Abd. VI with one pair of tubercles, prominently projected. Chaetotaxy as follows (Fig. 4):

Head	+2)
	----ii+(2)
	i+1)----(ii+1)
	-(1)------(1)------(1)--(8-10)
Th. I	------(1)------(2)------(1)
II	--(2)-----(s+3)-----(3+s)-----(3)
III	--(2)-----(s+3)-----(3+s)-----(3)
Abd. I	--(2)-----(2+s)-----(2)------(3-4)
II	--(2)-----(2+s)-----(2)------(5)
III	--(2)-----(2+s)-----(2)------(5)
IV	-(2)------(1+s)-----(3)------(6-8+s)
V	---(1)(s)(3)------(s+1+ii-iii)
VI	-----(7)

O-seta on frontal tubercles present. O-, D- and E-setae and a- and p-setae on ocular tubercle microchaeta even on adult specimens. Each of the inner three tubercles of occipital area with one macrochaeta, but no microchaeta (Fig. 5A). Mesochaeta on Dit and Det of thorax and abdomen for juveniles sometimes difficult to distinguish with microchaeta. Det and Dlt of Th. II and III, and Det of Abd. I-V with a fine sensory hair.

Labrum and labium apically truncated (Figs. 6A, B). Mandible quadridentate, apical two teeth small (Fig. 6C). Maxilla styliform, bifurcate at apex (Fig. 6D). Ant. III and IV fused dorsally. Ant. III organ consisting of 2 papillae in a large hollow with one blunt sensory hair apart ventrally (Fig.

6F). Ant. IV apically trilobed and dorsally with nine olfactory hairs, six on inner side, three on outer side (Fig. 6E). PAO absent. Ocelli 3+3, two anteriorly and one outer posteriorly from ocular tubercle, sometimes pigmented. Tenent hair of legs absent. Unguis large with one strong tooth basally (Fig. 6G). Unguiculus absent. Ventral tube with 4+4 setae apical-laterally.

Type material: Holotype female, a paratype juvenile, an evergreen broadleaved forest which has no records of clear-cut on the slope of Mt. Nishimedake, Kunigami-son, Okinawa main land, 17 Nov. 2007, M. Hasegawa leg. Holotype (Type No. 3272 Kyushu Univ.) and a paratype are deposited in the Entomological Laboratory, Faculty of Agriculture, Kyushu University.

Other materials examined: Three specimens juveniles, same data as for holotype.

Remarks: The present new species is characterized by the presence of O-seta, the unguis with a inner tooth, 1 seta on Dlt of occipital region, 1 seta on Dit of Th. I, 2 setae on Dit of Th. II, III and dorsal side of Abd. V with 3+3 tubercles. The present new species resembled *P. pterothrix* (Börner, 1909) because they have the similar forms of labrum, mandible and four tubercles on occipital area (Yoshii 1995). But *P. pterothrix* is different with the present species by the points below; 1) no O-seta in *P. pterothrix* (O-seta present in the present species), 2) two macrochaetae on ocular tubercle in *P. pterothrix* (one macrochaeta in the present species), 3) two macrochaetae on Det and Dlt of occipital area in *P. pterothrix* (one macrochaeta in the present species) and, 4) Dit and Det on Abd. V fused in *P. pterothrix* (separated in the present species) (Yosii, 1956b, Yoshii, 1995). *P. lapidicola* Cassagnau and Deharveng, 1981 (recorded in Nepal) and *P. kinabaluensis* Yoshii, 1981 (recorded in Sabah, Malaysia) also have O-seta and a inner tooth of unguis (Cassagnau and Deharveng 1981, Yoshii 1981). But the former species has only 2+2 tubercles on dorsal side of Abd. V and the latter species has 3 setae on Dlt of occipital region and 3 setae on Dit of Th. II, III.

Etymology: The specific name is derived from the old district name of the type locality 'Yambaru', northern part of Okinawa main Island.

Yuukianura szeptyckii* Deharveng and Weiner, 1984*[Japanese name: Kishibe-ibotobimushi]****(Figs. 6H-K)**

The characters for this species originally described in

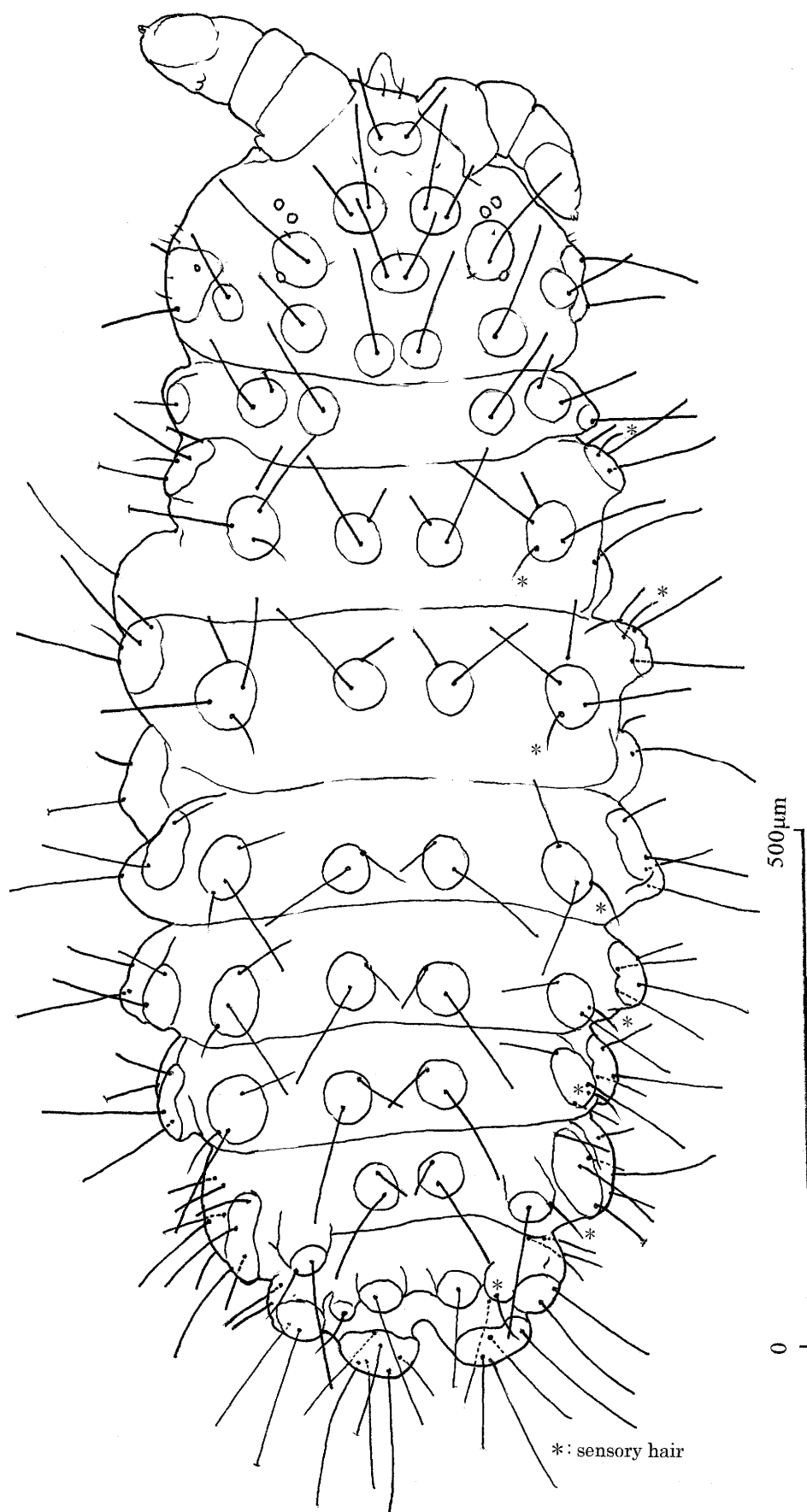


Fig. 4. *Propeanura yambaru* sp. nov., holotype, female. Dorsal view.

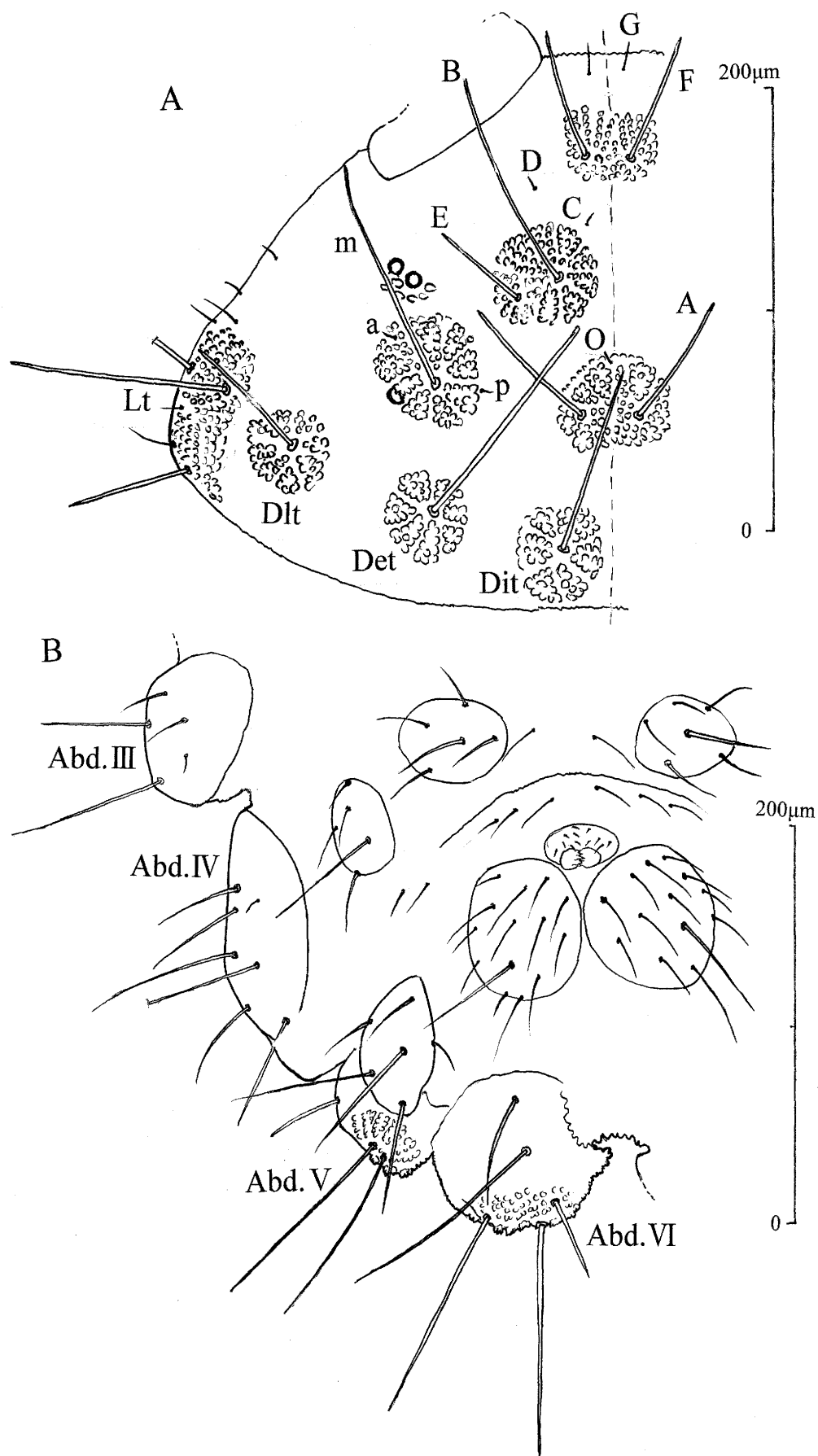


Fig. 5. *Propeanura yambaru* sp. nov., holotype, female. A, head; B, ventral view of Abd. IV -VI.

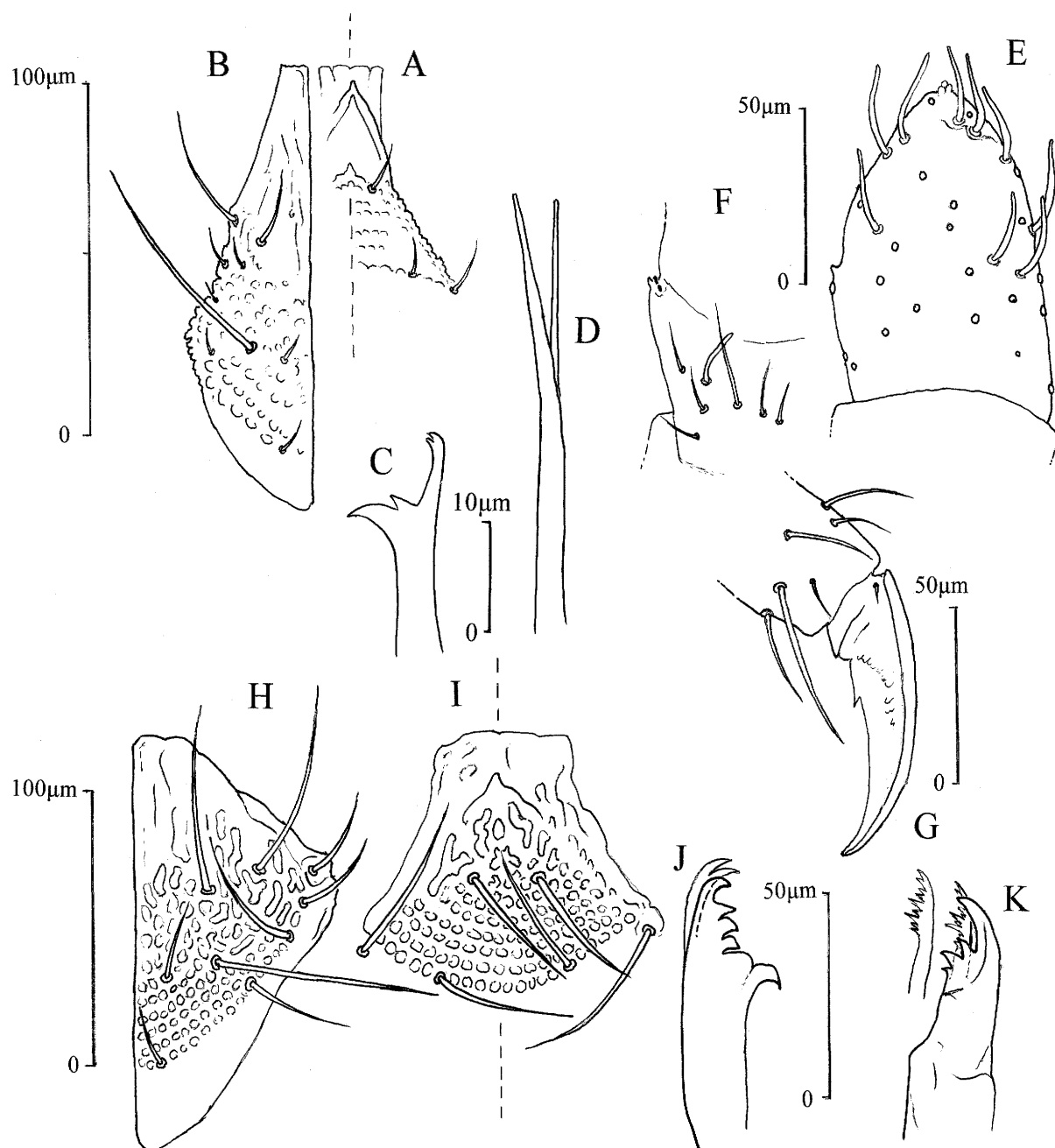


Fig. 6. *Propeanura yambaru* sp. nov. (A-G) and *Yuukianura szeptyckii* Deharveng and Weiner, 1984 (H-K). A, H, labrum; B, I, labium; C, J, mandible; D, K, maxilla; E, dorsal side of Ant. III - IV; F, ventral side of Ant. III; G, unguis of hind leg. A, B, , holotype, female; C - G, Paratype, juvenile. Arrows show sensory hair and a small appendage.

North Korea almost agreed with those investigated here, even though we examined them precisely. We revise the chaetotaxy following the way proposed by Yosii (1969), because the original description of chaetotaxy is inconvenient for the comparison with other species. The description for the mouthparts which was not enough described originally are added with figures.

Body length 2.3mm. Colour red or orange in living, white

in alcohol. Body form cylindrical like Onychiuridae species. Dorsal tubercles low. Median area of head without clypeal, antennal, and frontal tubercles. Occipital area - Abd. IV without Dit. Body setae bearded from the flat body surface. Lt on Th. I - Abd. IV and tubercles on Abd. V-VI highly represented. Microchaetae placed outside of the boundary of tubercles. Macrochaetae blunt, apically acuminate and scarcely faintly barbed. A-, B-, F-setae and p-seta on ocular

tubercle macrochaetae. O-, C-, D- and E-setae microchaetae. Setae on the posterior part of Lt looked like sensory hairs. Chaetotaxy as follows:

Head +2
-iii+1
i+1----3
--1+ii-----ii-iii+1----- (10-13)
Th. I ---1-----2----- (1)
II --i-ii+1-----iii+1+s----- (2-3+s)----- (3)
III --ii+1-----ii-iii+1+s----- (2-3+s)----- (4)
Abd. I --i+1-----ii+(1+s)----- (2)----- (3)
II --i+1-----i+(2+s)----- (2)----- (3)
III --i+1-----i+(2+s)----- (2)----- (3-4)
IV --i+1----- (2+s)----- (3)----- (4-5+s)
V ----- (3+s) (4) ----- (4-5)
VI ---- (7)

Proboscis apically round, apical part of labrum and labium blunt and wide (Fig. 6H, I). Mandible with five strong teeth and an apical thin lamella with two teeth (Fig. 6J). Maxilla with strong 3-4 teeth (apical one is broad, basal one small or sometimes lost) and thin lamella with about ten fine teeth. A needle-like appendage unrecognized (Fig. 6K). Ant. III-IV with nine sensory hairs. Ocelli unpigmented, 3+3, two of them a little apart anteriorly from ocular tubercles. Unguis of legs broad, with an inner tooth basally. Unguiculus absent.

Materials examined: Several hundred specimens, collected from bank of Mikasa river, Nisitsukikuma, Hakata, Fukuoka, 8 Oct. 1979; twelve specimens, collected from bank of Umi river, Futamatase, Hakata, Fukuoka, 20 Mar. 2008, all being S. Tanaka leg.

Notes: This species was recorded in Mt. Pektu-san, North Korea (Deharveng and Weiner, 1984). This Japanese record is second report. This species was collected from the forest soil in Korea, in contrast here we collected this species from the sand samples at the bank near the mouth of the river. Other species in the genus *Yuukianura* have often been collected at the river banks or shores of a sea or lake (Yoshii and Sawada 1997, Yosii 1959, 1964, 1971). The report collected from the forest soil in North Korea is an exceptional case. The Japanese vernacular name is derived from the Japanese 'Kishibe' meaning a bank of river.

Neanura (Deutonura) nijimae sp. nov.

[Japanese name: Nijima-ibotobimushi]

(Fig. 7)

Small, body length 0.9mm. Colour white except ocelli.

Number of dorsal tubercles: 4, 6 / 4, 8, 8 / 8, 8, 8, 3, 2 (Fig. 7A). Antennal and frontal tubercles fused and formed into tubercle. B-D and B-E tubercle elements of tubercle absent. Clypeal and ocular tubercles apart from tubercles. Dit and Det on occipital area fused. Th. I without Dit, with only one seta a little apart from the place of their typical one. Det on Abd. IV unfused. Chaetotaxy as follows (Fig. 7A):

Head +2)
1+3)+2----- (i+2)
--(4)----- (6)----- (10-13)
Th. I -----1----- (2)----- (1)
II --(3)----- (s+1)----- (3+s)----- (3)
III --(3)----- (s+1)----- (3+s)----- (3)
Abd. I --(2)----- (2+s)----- (2)----- (3)
II --(2)----- (2+s)----- (2)----- (3)
III --(2)----- (2+s)----- (2)----- (4)
IV --(2)----- (2+s)----- (3)----- (6-7)
V 2+i)----- (s+8)
VI ---- (7)

A-seta of ocular tubercle and a₁-seta of Abd. V microchaeta. O-seta present. O-, C-, D- and E-setae mesochaetae, but not acuminate (Fig. 7A). These macrochaetae long and not apically blunt. Det and Dlt of Th. II and III, Det of Abd. I-IV and Lt of Abd. V with a short sensory hair.

Mouthpart ordinal one. Ant. III and IV fused dorsally with apical trilobes, surrounded by distally curved seta on high sockets, bearing large semi-circularly curved seta nearby. Eight olfactory hairs also curved semi-circularly. Ant. III organ with two small papillae in a deep hollow. One sensory hair around Ant. III organ straight and lain flat on surface of basal margin of Ant. IV (Fig. 7B). Ventral side of Ant. III with one sensory hair and a short appendage (Fig. 7C). PAO absent. Ocelli 2+2, anterior one former ocular tubercle and posterior one in ocular tubercle, well pigmented. Tenent hair of legs absent. Unguis untoothed. Unguiculus absent.

Type material: Holotype female, Monomanai, Otoineppu Village, Nakagawa-gun, Hokkaido, 3 Sep. 1969, K. Nijima leg. Holotype (Type No. 3273 Kyushu Univ.) is deposited in the Entomological Laboratory, Faculty of Agriculture, Kyushu University.

Remarks: In spite of only one specimen, very remarkable characters were recognized from this species, thus we described here. Although holotype specimen has asymmetrical and unnatural chaetotaxy (1+i+2+i) of dorsal

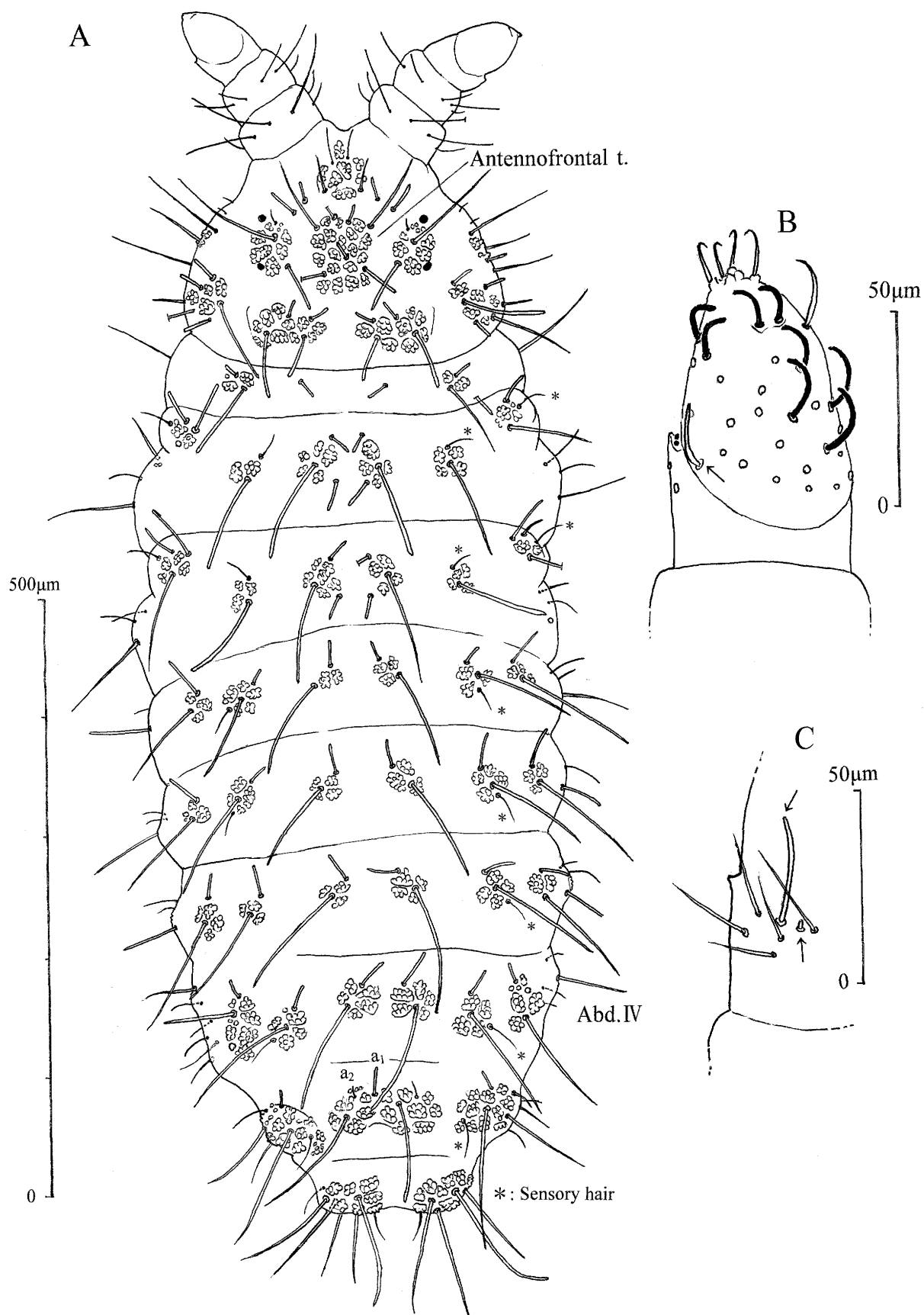


Fig. 7. *Neanura (Deutonura) nijimae* sp. nov., holotype, female. A, dorsal view; B, dorsal side of Ant. III-IV; C, ventral side of Ant. III. Arrows show sensory hair and a small appendage.

median tubercle on Abd. V (Fig.7), this might be a malformed individual. Chaetotaxy (1+ii+1) or (2+2) seems to be a normal type.

The present new species is similar to *N. abietis* Yosii, 1969 because they have two seta on Det of Th. I, unfused Dit of Abd. IV, antennofrontal tubercle separated from clypeal and ocular tubercle, presence of O-seta (Yosii, 1969) and white body colour. But *N. abietis* is different with the present new species by a blue body colour and by having B-D and B-E tubercle elements of antennofrontal tubercle (body colour white and lacking these tubercle elements in the present new species).

The present new species is also similar to *N. yoshiiana* Deharveng and Weiner, 1984 because it has 2 setae on Det of Th. I, unfused Dit of Abd. IV, antennofrontal tubercle separated from clypeal and ocular tubercles, presence of O-seta and white body colour (Deharveng and Weiner, 1984). But the present species is distinguished from the cited species by pigmented ocelli and shrunk frontal tubercle.

The nearest species of the present one seems to be *N. fodinarum* Yosii, 1956 with the white body colour and the lack of B-E tubercle element of antennofrontal tubercle (Yosii 1956a). But *N. fodinarum* is distinguished with the present new species by the points below: 1) five macrochaetae on Dlt of occipital area in *N. fodinarum* (six setae in the present species), 2) two macrochaetae on Det of Th. II and III in *N. fodinarum* (one macrochaeta in the present species), 3) B-D tubercle element of antennofrontal tubercle present in *N. fodinarum* (absent in the present species).

Etymology: This species is dedicated to Dr. K. Nijjima, who helped us in providing materials.

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摘要

田中真悟 (〒 819-0041 福岡市西区拾六町 5-9-40), 長谷川元洋 (〒 397-0001 長野県木曽郡木曽町福島 5473 独立行政法人森林総合研究所木曽試験地): 日本産イボトビムシ科の 3 新種と 1 新記録種.

イボトビムシ科の 3 新種を記載し, 日本新記録の 1 種を再記載した. クニガミイボトビムシ (新称) *Vitronura kunigamiensis* sp. nov. は触角イボに D, E 毛がなく, 頭頂イボに O 毛がない; 眼イボに p 毛がない; 小型で体剛毛が短いなどの特徴がある. ヤンバルイボトビムシ (新称) *Propeanura yambaru* sp. nov. は頭頂イボに O 毛がある; 爪に内歯がある; 後頭部の背側イボの毛は 1 本; 胸部第 I 節の背内イボの毛は 1 本; 第 II, III 節の背内イボの毛は 1 本; そして腹部第 V 節のイボが 3 対あることなどの特徴がある. ニイジマイボトビムシ (新称) *Neanura (Deutonura) nijijimae* sp. nov. は小型種; 白色で眼だけ青; 後頭部の背側イボの毛は 6 本; 胸部第 II 節の背内イボの毛は 1 本; 腹部第 I - III 節の背内イボの毛は 2 本; そして頭頂イボに B-D 片がないなどの特徴がある. 北朝鮮の森林でのみ知られていたキシベイボトビムシ (新称) *Yuukianura szeptyckii* Deharveng and Weiner, 1984 が福岡市内の川岸の砂中で大量に発見された. 日本新記録である.

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